

Biological Assessment
for the
**BWCAW NON-NATIVE INVASIVE PLANT
MANAGEMENT PROJECT**

Terrestrial Wildlife Evaluation and Assessment:

Prepared by: Jack Greenlee
Jack Greenlee, Ecologist

Date: 8/6/13

Terrestrial Wildlife Evaluation and Assessment:

Reviewed by: Dan Ryan
Dan Ryan, Wildlife Biologist

Date: 8/6/13

EXECUTIVE SUMMARY	1
DETERMINATION OF EFFECTS SUMMARY	1
BIOLOGICAL ASSESSMENT	2
<i>1.0 Introduction</i>	2
<i>1.1 Consultation with the U.S. Fish and Wildlife Service</i>	2
<i>1.2 No Action (Alternative 1)</i>	2
<i>1.3 Proposed Action (Alternative 2)</i>	3
<i>1.4 Alternative 3</i>	5
<i>1.5 Comparison of Alternatives</i>	5
<i>2.1 Description of affected species</i>	6
<i>2.2 Effects Analysis</i>	6
<i>3.1 Threatened and Endangered Species – Canada Lynx</i>	9
<i>4.0 References</i>	12
<i>Appendix A – herbicide reference tables</i>	14

Executive Summary

This Biological Assessment analyzes the effects of the BWCAW Non-Native Invasive Plant (NNIP) Management Project on Threatened and Endangered species. There are approximately 14.3 acres of known NNIP that would be treated, and future NNIP infestations may be treated as well depending on the alternative. For Alternative 1, all of the known infestations would be treated by handpulling. Under Alternative 2, a combination of herbicide spot application and handpulling would be used to treat all of the known infestations, plus approximately 40-60 acres of NNIP that may spread in the project area in the future. Under Alternative 3, handpulling would be used to treat all of the known infestations plus approximately 600-650 acres of NNIP that may spread in the project area in the future.

None of the alternatives would negatively impact lynx habitat. Under all alternatives, selectively removing NNIP from small infestations scattered across the BWCAW would not negatively affect hare habitat or lynx denning habitat. Under Alternative 2, there would be no impacts of herbicide use to lynx because the herbicides proposed for use are low toxicity, the use would be very dispersed, and because the herbicide exposure routes involving lynx prey are very unlikely. All alternatives would help limit future impacts of NNIP to lynx. The BWCAW NNIP Management Project would have no effect on the Canada lynx or its critical habitat.

Determination of Effects Summary

Alternative 1 would have no effect on Canada lynx and would cause no adverse modification to lynx critical habitat.

Alternative 2 would have no effect on Canada lynx and would cause no adverse modification to lynx critical habitat.

Alternative 3 would have no effect on Canada lynx and would cause no adverse modification to lynx critical habitat.

Biological Assessment

1.0 INTRODUCTION

This Biological Assessment (BA) evaluates the effects of the proposed BWCAW Non-Native Invasive Plant Management (NNIP) Project on federal Threatened and Endangered species. The BA tiers to the Programmatic Biological Assessment for the revision of the Forest Plan (USDA Forest Service 2004) and the Programmatic Biological Assessment for listed species on the Superior National Forest (USDA Forest Service 2011) and provides more specific information on site-specific effects of the project to threatened and endangered species. This BA was prepared in compliance with U.S. Department of Agriculture (USDA) Forest Service Manual sections 2670.3, 2670.5 (3), 2672.4, the Endangered Species Act of 1973 as amended, the National Forest Management Act of 1976, the Superior National Forest Land and Resource Management Plan, and Recovery Plans and Conservation Assessments and Strategies. The species evaluated in this report is the federally threatened Canada lynx.

The management objective is to maintain viable and well-distributed representation of all native species that occur on the Superior National Forest (National Forest Management Act Regulation 219.19 and 219.26, Secretary of Agriculture Regulation 9500-4, USDA Forest Service Manual 2670.12, 2670.22, and 2670.32, Forest Plan p. 3-4). I used the following working definitions for viability and well-distributed from Iverson and René (1997):

- viability--the likelihood that habitat conditions will support persistent and well-distributed populations over time;
- well-distributed--species and habitat distribution are based on the current and historic natural distribution and dispersal capabilities of individual species, and dispersal includes the concepts of metapopulation dynamics and gene flow.

1.1 CONSULTATION WITH THE U.S. FISH AND WILDLIFE SERVICE

As outlined by section 7 of the Endangered Species Act, the Forest Service is required to enter into formal/informal Consultation or Conferencing with the US Fish and Wildlife Service (USFWS) for any proposed activity that is likely to “affect” species federally listed as endangered, threatened, or proposed for listing. Consultation is permissible but not required for No Effects determinations. This analysis finds that this project would have *no effect* on the federally listed Canada lynx or its critical habitat. Although no concurrence was required for this project, the Fish and Wildlife Service was contacted as a courtesy and provided a copy of this BA.

1.2 NO ACTION (ALTERNATIVE 1)

Under the no action alternative the Superior National Forest would implement the existing management decision from the 2006 Decision Notice for the Superior National Forest Non-native Invasive Plant Management Project (2006). The 2006 Decision Notice authorizes use of manual treatment methods to treat approximately 5.5 acres of NNIP that were known in the BWCAW in 2006 plus the approximately 8.8 acres of NNIP that have been found since then for a total of 14.3 acres, or in other words, all the known NNIP in the wilderness. An integrated pest management approach would be used. This means that not only would the Forest implement treatments proposed here, we would also continue to implement existing programs of prevention, coordination, inventory and monitoring, and education to reduce the risk of future NNIP impacts.

1.3 PROPOSED ACTION (ALTERNATIVE 2)

In order to maintain and improve aquatic and terrestrial wildlife habitat, to maintain healthy, resilient native plant communities, and to maintain the character and ecological integrity of the Boundary Waters Canoe Area Wilderness (BWCAW), the Superior National Forest proposes to implement a non-native invasive plant management project, beginning with treatments on a total of approximately 14.3 acres at sites scattered across the 1.1 million acre wilderness and possibly expanding up to 40-60 acres over the next 10 years. The Forest Service proposes to manage NNIP populations using an integrated combination of control methods based on the species and site. These control methods would include hand pump or sponge herbicide application and manual control methods. Table 1 summarizes the proposed treatments.

Table 1. Treatment summary for proposed action				
KNOWN NNIP LOCATIONS (1137 sites)				
Species Name	Total acres	Acres manual control	Acres using herbicide	Herbicide
Bull thistle	0.07	0.07		
Canada thistle	2.9		2.9	Aminopyralid
Cypress spurge	0.1		0.1	Imazapic
Goutweed	1.8		1.8	Metsulfuron methyl
Non-native hawkweeds	2.8		2.8	Aminopyralid
Leafy spurge	0.02		0.02	Imazapic
Oxeye daisy	1.5		1.5	Aminopyralid
Purple loosestrife	0.3		0.3	Triclopyr
Siberian peabush	0.0002		0.0002	Triclopyr
Spotted knapweed	3.4	3.4		
St. Johnswort	0.004		0.004	Metsulfuron methyl
Tansy	1.4		1.4	Metsulfuron methyl
Tatarian honeysuckle	0.02		0.02	Triclopyr
TOTALS (known infestations)	14.3	3.5	10.8	
PROJECTED FUTURE NNIP LOCATIONS				
Approximately 40-60 acres of herbicide or manual treatments				

These treatments would occur over the next ten years. A ten-year treatment period is needed because many of the species listed in Table 1 produce seed that remains viable in the soil for 7-10 years or more; therefore, follow-up treatments would be needed as described below. Implementation would begin in summer 2013. Of the 1137 known NNIP occurrences, most occur on campsites (48%), while others occur on portages or trails (26%), along shorelines

(13%), at old resort/cabin sites (7%), or in burned areas (6%). Information about the proposed herbicides is summarized in Table 2.

Manual methods would be used for the tap-rooted species bull thistle and spotted knapweed; pulling one of these species and getting the whole taproot kills the plant. Herbicide application would be used for the remaining species which have rhizomatous root systems that make manual methods ineffective (a rhizome is a horizontal underground root).

Table 2. Proposed Herbicides and Treatment Methods

Common chemical name	Examples of trade names	Targeted Use	Weeds targeted
Triclopyr	Garlon3A [®]	Stump treatment, foliar treatment; broadleaf-selective	Siberian peabush, Tatarian honeysuckle, purple loosestrife
Imazapic	Plateau [®]	Foliar treatment, non-selective	Leafy spurge, Cypress spurge
Aminopyralid	Milestone [®] VM	Foliar treatment; broadleaf selective	Canada thistle, Hawkweeds, Oxeye Daisy
Metsulfuron methyl	Escort XP [®]	Foliar treatment; broadleaf selective	Tansy, St. Johnswort, Goutweed

All herbicides (Table 2) would be used according to manufacturer label direction (e.g., regarding rates, concentrations, application frequency, and application methods). All herbicides would be applied using ground-based spot application. Spot application directs herbicides to target plants with minimal exposure to humans, desirable vegetation, or other non-target organisms. Two pieces of equipment would be used for spot application: a small hand pump connected to a spray wand, and a wipe-on applicator. Wipe on methods involve rubbing a sponge wetted with herbicide against a leaf surface or a cut stump; this method would be used for purple loosestrife, on NNIP on rock outcrops next to waterbodies, and for stump treatments of woody species. The hand pump would be used for spot application on NNIP located more than 25 feet from water. There would be one herbicide application per site per year with follow-up monitoring and possible treatment in subsequent years, consistent with label directions regarding the frequency.

Manual treatments would be conducted on the tap-rooted species bull thistle and spotted knapweed. The plant and its tap root would be removed from the ground by pulling or digging. After treatment, NNIP remains would be disposed of in such a way as to prevent them from starting a new infestation elsewhere.

The environmental characteristics and toxicity of the herbicides proposed for use are summarized briefly in Table 3 and in more detail in Appendix A – Herbicide Reference Tables. For more details about the alternatives, see Chapter 2 of the DEIS. For locations of the known treatment sites, see attached maps.

Table 3. Environmental characteristics and toxicity of proposed herbicides

Herbicide	Soil mobility	Average Soil half-life	Water half-life	Toxicity to Mammals	Toxicity to Birds	Toxicity to Fish	Toxicity to Invertebrates
-----------	---------------	------------------------	-----------------	---------------------	-------------------	------------------	---------------------------

Table 3. Environmental characteristics and toxicity of proposed herbicides

Herbicide	Soil mobility	Average Soil half-life	Water half-life	Toxicity to Mammals	Toxicity to Birds	Toxicity to Fish	Toxicity to Invertebrates
Triclopyr	moderate-high	30 days	4 days (but only hours in sunlight)	low	low	low	low
Imazapic	low	106 days	1-2 days	low	low	low	low
Aminopyr-alid	moderate-high	104 days (lab study); 32 days in field study	½ day	low	low	low	low
Metsulfuron methyl	Moderate-high	120-180 days	1-8 days	low	low	low	low

*Technical grade glyphosate has low toxicity to fish, but the surfactants in some formulations are highly toxic to fish. Some formulations of glyphosate are labeled for aquatic use.
SOURCE: BE Appendix A

1.4 ALTERNATIVE 3

Under the Alternative 3 the Superior National Forest proposes to use manual treatment (e.g. hand pulling) methods to treat approximately 14.3 acres of known NNIP infestations plus approximately 600-650 acres of new NNIP infestations that may be found in the future. The acreage of estimated future NNIP spread is greater for Alternative 3 than for Alternative 2 because of the generally lower effectiveness of manual methods against the target NNIP species.

An integrated pest management approach would be used. This means that not only would the Forest implement treatments proposed here, we would also continue to implement existing programs of prevention, coordination, inventory and monitoring, and education to reduce the risk of future NNIP impacts.

1.5 COMPARISON OF ALTERNATIVES

Table 4 provides a brief comparison of Alternatives 1 - 3.

Table 4. Comparison of alternatives

	Alternative 1 – No Action	Alternative 2- Proposed Action	Alternative 3
Known NNIP acres proposed for treatment	14.3 acres	14.3 acres	14.3 acres
Estimate of maximum NNIP spread	600-650 acres	40-60 acres	600-650 acres
Estimate of additional NNIP to treat as new infestations are found	No authority for treating additional infestations	40-60 acres	600-650 acres
Number of treatments required to control small populations	Tap-rooted species: 2-3 Rhizomatous species: 3-5	Tap-rooted species: 2-3 Rhizomatous species: 2	Tap-rooted species: 2-3 Rhizomatous species: 3-5
Number of treatments required to control large populations	Tap-rooted species: 3-5 Rhizomatous species: 10	Tap-rooted species: 3-5 Rhizomatous species: 2-4	Tap-rooted species: 3-5 Rhizomatous species: 10

2.1 DESCRIPTION OF AFFECTED SPECIES

Canada lynx is the only federally listed species present on the Superior National Forest. The project area is within an area designated as critical habitat for Canada lynx, and there are known occurrences of lynx in the project area (MNDNR 2006). They use a variety of habitats and depend on adequate prey abundance as well as low human disturbance.

2.2 EFFECTS ANALYSIS

For Alternative 1, the Biological Assessment was written in 2006 for the Superior National Forest Non-native Invasive Plant Management Project. The effects are summarized below but please see the 2006 BA for the full analysis (USDA Forest Service 2006). Two animals, gray wolf and bald eagle, were Federally listed as Threatened in 2006, but are on the Region 9 Regional Forester's Sensitive Species list now, and they are analyzed for all alternatives in the Biological Evaluation rather than the Biological Assessment.

The analysis below compares the proposed use of herbicides in this project to the outcomes of Forest Service herbicide risk analyses. The USDA Forest Service contracted with Syracuse Environmental Research Associates (SERA) to evaluate ecological and toxicological data based on Environmental Protection Agency (EPA) studies and other current peer-reviewed scientific literature. Analysis of the risks to wildlife and aquatic resources from the proposed use of herbicides is based on SERA Human Health and Ecological Risk Assessments (RAs), their associated worksheets, and other documents. The SERA RAs and worksheets are incorporated into this analysis and can be found at <http://www.fs.fed.us/foresthealth/pesticide/risk.shtml>.

SERA's risk assessments quantitatively characterize the risks for all four herbicides proposed for use in this project (RAs: metsulfuron methyl - SERA 2004; imazapic - SERA 2004; aminopyralid - SERA 2007a; triclopyr - SERA 2011a; worksheets: metsulfuron methyl – SERA 2006; imazapic – SERA 2006; aminopyralid – SERA 2007b; triclopyr – SERA 2011b and SERA 2011c). The RAs quantify hazards posed by the herbicides, quantitatively estimate herbicide exposure to wildlife and aquatic resources, and describe a dose-response relationship to come up with the ecological risk of the herbicide to wildlife and aquatic resources.

The toxicities of the four herbicides proposed for use are presented in detail in DEIS Appendix D. During the herbicide registration process, the EPA evaluated the toxicity of all of these herbicides on wildlife and aquatic resources. Judgments about the potential hazards of herbicides to these resources are based, in large part, on the results of standard acute and chronic bioassays on mammals, birds, fish, invertebrates, and in some cases amphibians. Detailed toxicological analysis and literature review for each herbicide are found in the SERA RAs. Triclopyr, imazapic, aminopyralid, and metsulfuron methyl are all low toxicity herbicides that have been used safely on the Superior National Forest for the last five years.

As part of each risk assessment, a set of general exposure scenarios was developed based on the normal use of the herbicides. These scenarios include: accidental direct spray of an organism, accidental contact with treated vegetation, eating contaminated vegetation or prey, drinking contaminated water, accidental spill in a pond, accidental spray/drift/leaching into a pond, and accidental spray/drift/leaching into a stream. These scenarios are very conservative, and many of

their assumptions model a worst-case scenario. Some of them model short-term (acute) effects, and others model long-term (chronic) effects.

During the herbicide registration process, toxicological studies are conducted on a variety of species. Generally these studies are used to develop the No Observed Adverse Effect Level (NOAEL – this is the level of herbicide at which no adverse effects are observed). The NOAELs are generally very conservative (i.e. health protecting) and are made even more conservative by the application of a safety factor of 100. The safety factor accounts for data uncertainty and other factors representing corrections for both intra- and inter-species variability. The RAs for these four herbicides generally compare the outcomes of the exposure scenarios to the NOAEL to evaluate whether the exposure scenarios for aquatic life could potentially exceed the dose at which adverse effects begin to be observed.

The RAs combine three factors: the herbicides' inherent hazard, an estimate of exposure, and a dose-response assessment. Together, these generate an estimate of risk for each scenario for each chemical – referred to as the Hazard Quotient (HQ). The HQ is the ratio between the estimated dose (the amount of herbicide received from a particular exposure scenario) and the dose at which no adverse effect is observed. When a scenario has a dose less than the NOAEL dose, then the HQ is less than 1.0, and toxic effects are unlikely for that specific scenario. The herbicides proposed for use in this project are compared in the effects analysis based on their HQ calculated in the pertinent RA.

Table 5 summarizes the findings of the ecological risk assessments to wildlife and aquatic resources.

BWCAW Non-native Invasive Plant Management Project

Table 5 Summary of findings from USDA Forest Service ecological risk assessments for proposed herbicides				
Risk Assessment Application Rate	Terrestrial Mammals	Birds	Insects	Fish & Other Aquatic Species
Imazapic (Source: SERA 2004, p. 4-20 – 4-24)				
0.1 lb a.e./acre (typical rate) 0.1875 lb a.e./acre (maximum rate)	No adverse effects are plausible using typical or worst case exposure scenarios at either average or maximum rates.	No adverse effects are plausible using typical or worst case exposure scenarios at either average or maximum rates.	No adverse effects are plausible using typical or worst case exposure scenarios at either average or maximum rates.	Very low risk of adverse effects at either average or maximum application rates
Triclopyr (Source: SERA 2011a, p. 130)				
1 lb a.e./acre (typical rate) 10 lb a.e./acre (maximum rate)	Mammals consuming contaminated vegetation are at risk of adverse effects. Large mammals are at greater risk than small mammals.	Birds consuming contaminated vegetation are at risk of adverse effects.	Triclopyr does not pose substantial risks to insects across the range of labeled application rates.	Neither terrestrial nor aquatic applications of triclopyr TEA pose substantial risks to aquatic animals across the range of labeled application rates.
Aminopyralid (SERA 2007a, p. 102)				
0.08 lb a.e./acre (typical rate) 0.11 lb a.e./acre (maximum rate)	There is no indication that mammals would be adversely affected by aminopyralid	There is no indication that birds would be adversely affected by aminopyralid	There is no indication that insects would be adversely affected by aminopyralid	There is no indication that aquatic animals would be adversely affected by aminopyralid
Metsulfuron methyl (Source: SERA 2004, p. 4-23 – 4-28)				
0.03 lb a.i./acre (typical rate) 0.15 lb a.i./acre (maximum rate)	Risk of adverse effects resulting from either average or maximum application rates is unlikely.	Risk of adverse effects resulting from either average or maximum application rates is unlikely.	Risk of adverse effects resulting from either average or maximum application rates is unlikely.	Risk of adverse effects resulting from either average or maximum application rates is unlikely.

3.1 THREATENED AND ENDANGERED SPECIES – CANADA LYNX

Analysis Area

The area covered by the analysis of direct and indirect effects includes all lands administered by the Superior National Forest in the BWCAW. The rationale for this choice is that this is the area where project activities, and hence, potential direct and indirect effects, could occur. The area covered by the cumulative effects analysis includes lands of all ownerships within the BWCAW. This cumulative effects analysis area was selected because the adjacent non-Forest Service lands in the project area share a number of physical characteristics (e.g. bedrock features, land forming processes) which have influenced and constrained land uses in a similar manner. Furthermore, lands of other ownerships are often in close proximity to Forest Service lands. For these reasons, the project area boundary makes a logical analysis unit for cumulative effects.

The time period for direct, indirect, and cumulative effects is ten years from the time project activities begin, because no effects of project activities would occur until implementation, and because most project activities should be completed within 10 years.

Existing Condition

There is designated “critical habitat” for lynx as defined by ESA in the project area.

In the Great Lakes region, lynx habitat includes boreal, coniferous, and mixed coniferous/deciduous vegetation types dominated by pine, balsam fir, black and white spruce, northern white cedar, tamarack, aspen, paper birch, conifer bogs and shrub swamps. Logs and windfalls provide cover for denning sites, escape, and protection from severe weather. Stand structure appears to be more important than forest cover type. Snowshoe hare are the primary prey species of the Canada lynx. Other important alternate prey species include red squirrel, flying squirrel, ground squirrel, porcupine, beaver, mice, voles, shrews, fish, and ungulates as carrion or occasionally as prey (Ruediger et al. 2000). The Project Area contains suitable denning habitat and foraging habitat for Canada lynx.

Several range-wide risk factors for lynx are identified in the Canada Lynx Conservation Assessment and Strategy (LCAS). Conservation measures have been developed with the intent to conserve the lynx, and to reduce or eliminate adverse effects from management activities on federal lands. Projects that implement them are generally not expected to have adverse effects on lynx, and the implementation of these measures across the range of the lynx is expected to lead to the conservation of the species. Conservation Measures from the LCAS have been incorporated into the Forest Plan. The BWCAW is recognized for its importance and contribution to lynx conservation and recovery in the Great Lakes Geographic Area (Reudiger et al 2000). For this reason the BWCAW is identified as refugium habitat for Canada lynx.

Direct/Indirect Effects

The Biological Assessment for the 2006 Superior National Forest Non-native Invasive Plant Project concluded that the alternative selected for that project in the 2006 DN would have no effects to the Canada lynx. The 2006 BA found that Alternative 1 would not cause any changes to suitable habitat for lynx prey or to lynx denning habitat. The 2006 BA also found that the project would not result in any new road or trail construction or any changes to lynx foraging habitat.

The treatments proposed for this project under Alternatives 2 and 3 would not cause any changes in suitable habitat for lynx prey or to lynx denning habitat. For Alternative 3, fourteen acres of known NNIP sites scattered over 1100 different sites in the BWCAW would be treated manually, and approximately 600-650 NNIP acres that may arise in the next ten years would also be treated manually. Existing treatment sites are generally small – 85% are 0.005 acres or less – and they are scattered across the BWCAW (see attached maps). Using manual treatments, approximately 600-650 acres of new infestations may arise and be treated in the future; we expect to continue to see the pattern of small, dispersed NNIP sites. Selectively removing NNIP from 600-650 acres (0.06% of BWCAW) of small sites scattered across the BWCAW would not negatively affect hare habitat or lynx denning habitat. Over 80% of the NNIP infestations are at sites frequented by humans like campsites, portages, trails, or old resort/cabin sites. Any effects from human disturbance would be minor and discountable since recreationists already visit most of the treatment sites. This project would not involve construction of any new access routes. There would be no herbicide effects from Alternative 3. Overall, Alternative 3 would not impact lynx or lynx critical habitat, and in the long term, eradication of NNIP would probably benefit lynx habitat through improvement of native plant communities.

For Alternative 2, fourteen acres of known NNIP sites scattered over 1100 different sites in the BWCAW would be treated manually or with herbicides, and approximately 40-60 NNIP acres that may arise in the next ten years would also be treated either manually or with herbicides. The average treatment site is small (0.01 ac), and because of the small, dispersed nature of the proposed treatment sites, Alternative 2 would not cause any changes in hare habitat or lynx denning habitat. Over 80% of the NNIP infestations are at sites frequented by humans like campsites, portages, trails, or old resort/cabin sites. Any effects from human disturbance would be minor and discountable since recreationists already visit most of the treatment sites. This project would not involve construction of any new access routes. Overall, Alternative 2 would not impact lynx critical habitat, and in the long term, eradication of NNIP would probably benefit lynx habitat.

Direct effects to individual lynx from contact with herbicide are unlikely. Lynx are mobile and would most likely leave during herbicide application. Even if lynx did contact treated vegetation, the risk assessments for all of the proposed herbicides suggest there is no plausible risk to lynx from dermal exposure to the proposed herbicides.

The SERA risk assessments evaluated the potential indirect effects of herbicide use on mammals, and these effects are summarized in Table 5. Except for triclopyr, it is unlikely that any adverse effects would result from either average or maximum application rates of aminopyralid, imazapic, or metsulfuron methyl. For triclopyr, the SERA risk assessment indicates that consumption of contaminated vegetation could cause a risk of adverse effects in mammals. However, because lynx are carnivores, this exposure route would not pose a risk to lynx. Lynx consumption of hares or red squirrels that ate vegetation treated with triclopyr is unlikely. Purple loosestrife is the only foliage that would be treated with triclopyr, and purple loosestrife is unlikely to be eaten by lynx prey. Even if lynx did eat prey that had consumed triclopyr-contaminated leaves, the risk assessment scenario that considered this route of exposure did not

suggest any plausible risk to the predator. Therefore, it is unlikely that Alternative 2 would cause any herbicide-related impacts to Canada lynx.

Cumulative Effects

Neither Alternative 1 nor Alternative 2 nor Alternative 3 would have any negative direct or indirect effects on Canada lynx, and therefore there would be no cumulative effects to this species.

Determination

Alternative 1 would have no effect on Canada lynx and would cause no adverse modification to lynx critical habitat.

Alternative 2 would have no effect on Canada lynx and would cause no adverse modification to lynx critical habitat.

Alternative 3 would have no effect on Canada lynx and would cause no adverse modification to lynx critical habitat.

4.0 REFERENCES

- DuPont. 2007. DuPont Escort XP technical bulletin. Available online (accessed 4/6/12): http://www2.dupont.com/Land_Management/en_US/assets/downloads/pdfs/General/K-14796.pdf
- Iverson, G.C., and B. René. 1997. Conceptual approaches for maintaining well-distributed, viable wildlife populations: a resource assessment. Pages 1-2 in K.R. Julin, compiler, Assessments of wildlife viability, old-growth timber volume estimates, forested wetlands, and slope stability. USDA Forest Service General Technical Report PNW-GTR-392.
- Minnesota Department of Natural Resources –2006. Canada Lynx sightings in Minnesota (March 2000 – November 14, 2006). http://www.dnr.state.mn.us/eco/nhnrp/research/lynx_sightings.html
- Ruediger, B., J. Claar, S. Gniadek, B. Holt, L. Lewis, S. Mighton, B. Naney, G. Patton, T. Rinaldi, J. Trick, A. Vandehey, F. Wahl, N. Warren, D. Wenger, and A. Williamson. 2000. *Canada lynx conservation assessment and strategy, 2nd edition (LCAS)*. USDA Forest Service, USDI Fish & Wildlife Service, USDI Bureau of Land Management, and USDI National Park Service. Forest Service Publication #R1-00-53, Missoula, MT. On line at <http://www.fs.fed.us/r1/wildlife/carnivore/Lynx/lcas.pdf>
- SERA. 2004. Metsulfuron methyl human health and ecological risk assessment – final report. Available online at: <http://www.fs.fed.us/foresthealth/pesticide/risk.shtml>. 152 pp.
- SERA. 2004. Imazapic human health and ecological risk assessment – final report. Available online at: <http://www.fs.fed.us/foresthealth/pesticide/risk.shtml>. 110 pp.
- SERA. 2007a. Aminopyralid human health and ecological risk assessment – final report. Available online at: <http://www.fs.fed.us/foresthealth/pesticide/risk.shtml>. 231 pp.
- SERA. 2011a. Triclopyr human health and ecological risk assessment – final report. Available online at: <http://www.fs.fed.us/foresthealth/pesticide/risk.shtml>. 267 pp.
- US Environmental Protection Agency. 2005. Pesticide fact sheet: aminopyralid. 56 pp. Available online at: <http://www.epa.gov/opprd001/factsheets/aminopyralid.pdf>
- USDA Forest Service 2004. Programmatic biological assessment for federally listed species: grey wolf and Canada lynx and their critical habitats on the Superior National Forest. Administrative report in planning record. On file with Forest Supervisor, Superior National Forest, 8901 Grand Ave. Place, Duluth, Minnesota 55808. Available online at: <http://www.fs.usda.gov/main/superior/landmanagement/planning>
- USDA Forest Service. 2006. Biological assessment/Biological evaluation of the non-native invasive plant management project. On file with Forest Supervisor, Superior National Forest, 8901 Grand Ave. Place, Duluth, MN. 55808. 116 pp.

USDA Forest Service 2011. Programmatic biological assessment for the revised forest Plans:Chippewa and Superior National Forests. Administrative report in planning record. On file with Forest Supervisor, Superior National Forest, 8901 Grand Ave. Place, Duluth, Minnesota 55808. Available online at:
<http://www.fs.usda.gov/main/superior/landmanagement/planning>

APPENDIX A – HERBICIDE REFERENCE TABLES

Table A-1. Herbicide environmental characteristics.			
Herbicide	Characteristics		
	Mechanisms of degradation	Half-life in soil	Mobility in Soil
Triclopyr	Degradation mainly by soil microbes	14 days	Moderate to high (K_{oc} = 59 [SERA 2011 p. 206])
Aminopyralid	Degradation by soil microbes and sunlight	130 days (lab study); 25-38 days in field studies	High (K_{oc} range = 1-27 [SERA 2007, p. 129])
Imazapic	Degradation primarily due to soil microbes	113 days (lab study); 31-410 days (field study)	Moderate (K_{oc} range = 7-267 [SERA 2004, p. tables-1])
Metsulfuron methyl	Degraded by soil microbes and chemical hydrolysis	120 days	Moderate to high (K_{oc} range = 4-206 [SERA 2004, p. tables-1, tables-5])

Table A-2. Herbicide Solubility, Half-life, and Aquatic Toxicity Data			
Herbicide	Solubility	Aquatic Half-life	Aquatic Toxicity and Bioconcentration
Triclopyr	Salt formulation is water-soluble.	Salt formulation can degrade in sunlight with a half-life of 1-8 days [SERA 2011 p. 204].	Acid and salt formulation is slightly toxic to fish and aquatic invertebrates. Triclopyr acid has relatively low potential for bioconcentration (SERA 2011, p. 62).
Aminopyralid	Soluble in water	About half a day – degraded by sunlight (SERA 2007)	Aminopyralid is practically non toxic to fish and aquatic invertebrates (USEPA 2005). Not expected to bioconcentrate in fish.
Imazapic	Soluble in water	30 days – degraded by sunlight	Low toxicity to fish (SERA 2004, p. 4-4). Very low level of bioconcentration in fish tissue (SERA, p. 3-17).
Metsulfuron methyl	Soluble in water	53-279 days (DuPont 2007)	Low toxicity to fish and aquatic invertebrates, (SERA 2004, p. 4-5 to 4-6). Studies suggest low potential for bioconcentration (SERA 2004, p. 3-19).

BWCAW Non-native Invasive Plant Management Project

Table A-3. Herbicide Toxicity Information For Mammals									
Herbicide	Acute Toxicity						Chronic Toxicity		
(Technical product unless specific formulation noted)	Oral LD ₅₀ (rat)	Dermal LD ₅₀ (rabbit)	4-Hour Inhalation LC ₅₀ (rat)	Skin Irritation (rabbit)	Skin Sensitization (guinea pig)	Eye Irritation (rabbit)	24-Month Dietary NOEL (mouse)	24-Month Dietary NOEL (rat)	12-Month Dietary NOEL (dog)
	mg/kg BW		mg/L				mg/kg BW/day		
Triclopyr									
Renovate	2574(M) 1847(F)	>5000	>2.6	May cause	May cause	Severe	NA	12	0.5
Garlon 3A	2574(M) 1847(F)	>5000	>2.6	May cause	May cause	Severe	↑ Chronic toxicity data available↑ only for technical triclopyr acid		
Aminopyralid									
Aminopyralid acid	5000	>5000	>5.5	No	No	Moderate-Severe	50 (NOAEL)	250 (NOAEL)	93 (NOAEL)
Milestone	5000	>5000	>5.79	Slight	No	Slight	↑ Chronic toxicity data available↑ only for technical aminopyralid acid		
Imazapic									
Imazapic	>5000	>5000	>4.83	None	No	Slight	>1288	>1133	150 (LOAEL)
Metsulfuron methyl									
Metsulfuron methyl	>5000	>2000	>5	Slight	None	Moderate	5000 ppm (18mo)	500ppm	500 ppm
Data from: Triclopyr – SERA 2011, Appendices 4, 5, & chapters 3.1.4, 3.1.5, 3.1.11-3.1.13; Aminopyralid – SERA 2007, Appendix 3-1 & USEPA 2005; Imazapic – SERA 2004, Appendix 1, & chapters 3.1.4, 3.1.5, 3.1.11-3.1.13; Metsulfuron methyl - SERA 2004, Appendix 1, & Chapters 3.1.4, 3.1.5, 3.1.11-3.1.13. NA = Not Available									

BWCAW Non-native Invasive Plant Management Project

Table A-4. Herbicide Toxicity Information for Birds, Invertebrates, and Fish									
Herbicide Formulation	Avian Receptors				Terrestrial Invertebrates		Aquatic Receptors		
(Technical product unless specific formulation noted)	Bobwhite Quail		Mallard Duck		Earth-worm	Honeybee	Daphnia	Bluegill	Rainbow Trout
	Oral LD ₅₀	8-day dietary LC ₅₀	Oral LD ₅₀	8-day dietary LC ₅₀	LC ₅₀	Topical LD ₅₀	48-hour LC ₅₀	96-hour LC ₅₀	96-hour LC ₅₀
	mg/kg BW	ppm (in food)	mg/kg BW	ppm (in food)	ppm (in soil)	ug/bee	Mg/L (in water)		
Triclopyr									
Triclopyr acid		2934	1698	5620	1110	>100	357-837	155	79
Triclopyr triethylamine salt		11,622	2055	>10000	146	>100	357-837	65-233	274-286
Aminopyralid									
Aminopyralid acid	>2250	>5556 mg/kg diet		>5496 mg/kg diet	>5000 mg/kg soil	>100	>98.6	>100	>100
Imazapic									
Imazapic	>2150	>5000	>2150	>5000		>100	100	>100	>100
Metsulfuron methyl									
Metsulfuron methyl	>5620ppm	>5620	>5620ppm	>5620	>1000 mg/kg soil	>25	>150	>150	>150
LD ₅₀ - Lethal Dose 50; LC ₅₀ - Lethal Concentration 50. From: Triclopyr – SERA 2011, Appendices 2, 3, 5, 7; Aminopyralid – USEPA 2005; Imazapic - SERA 2004, Appendices 2, 3; Metsulfuron methyl - SERA 2004, Appendices 2, 3, 5, 6; DuPont 2007 (for toxicity to earthworm).									